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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Device for the Wireless Transmission of Measured Values at Motor Vehicle Wheels and Tyres

I, KURT FRITZE, Steindamm 25, 2 Hamburg 1, Germany, a citizen of the Federal Republic of Germany, do hereby declare the invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

It is known to monitor the values of variables of motor vehicle wheels such as tyre pressure, temperature and balance and to transmit a warning signal to the driver of the vehicle if a parameter falls outside its permitted range. To this end a conductor in the wheel serves as a transmitting aerial or as an inductive or capacitive coupling element in an oscillatory circuit.

In one known example a small battery-powered transistor transmitter is mounted on the valve and transmits a warning signal to a receiver on the vehicle chassis when a transducer senses that the tyre pressure is too low. Such a transmitter is subject to extremely high accelerations, is liable to damage or tempering and an adequate signal is only received when the transmitter is opposite a receiver aerial coil on the chassis and if the transmitter is not so positioned when the vehicle is stationary, the driver cannot make a check before commencing to move.

In the specification of my German Patent No. 1048195 I have described a partial solution to these problems in which the element mounted on the wheel merely acts as a variable inductive or capacitive coupling in an oscillator circuit whose active components and power supply are mounted on the vehicle rather than the wheel. The said element is altered by, e.g. temperature and/or air pressure-responsive structural elements or switches. However this arrangement can still be subject to the difficulty of only operating over a limited angular range of wheel positions.

In this connection it has been proposed to monitor air pressure by placing a rubber sac of oval cross-section between the tyre and the inner tube under the tread, a pressure-operated switch and inductance being embedded in the sac. It is difficult to mount this device without unbalancing the wheel and without so distorting the device as to upset its calibration. What is more it is difficult to combine the device with a temperature monitoring transducer responsive to the wheel rim temperature.

According to the present invention there is provided a device for monitoring the value of at least one variable of a motor vehicle wheel, comprising an element which extends around the whole circumference of the wheel and either acts as an aerial for a wheel-mounted transmitter coupled to one or more transducers which is or are responsive to the one variable or responsive to each to a corresponding one of several variables, or which element acts passively as an inductive or capacitive coupling element in an oscillator circuit whose active components and power supply are mounted on the vehicle chassis and which coupling element is altered in its effect in response to variations of the variable or variables to vary the effective coupling value with respect to the said active components of the oscillator circuit.

It is impracticable, in cross-country vehicles at least, to mount the said element in the tread of the tyre and, although the sidewall would make a satisfactory location from the point of view of obtaining good coupling, this location is ruled out because of the severe bending to which the sidewall is subjected. On the other hand the element must not be

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electrically shielded from the vehicle mounted components by the wheel rim.

Therefore it is proposed to mount the element sufficiently close to the rim not to be affected by the sidewall bending but where the rim does not shield the element electrically. In the case of tubeless tyres, conductive foils, strands or wires together with a transducer or transducers can be embedded in the tyre in such a location. Such components can also be mounted in such a location within the inner tube of a tubed tyre but this can give rise to constructional difficulties. Hence an alternative location is in a rim band interposed between the rim and the inner tube. The band must project radially from the rim sufficiently to remove the conductors from the shielding effect of the rim.

In the embodiment of the invention shown in the sole Figure of the accompanying drawings a tubed tyre has an outer cover 1 and an inner tube 2 fitted on the rim 4 of the wheel. A conventional air inlet valve 7 is shown connected to an air line 5. A rim band 6 is disposed between the rim and inner tube and three copper strands 3 extending around the whole circumference of the wheel are embedded in the radially outermost portion of one flange of the rim band 6 running out between the tyre 1 and inner tube 2. Transducers (not shown), each corresponding to a respective variable to be monitored, act upon the copper strands to vary the coupling in an oscillator circuit in which the strands 3 act as a coupling element. The transducers can comprise a temperature transducer in thermal contact with the rim.

The oscillator frequency should not be too high, otherwise the ferromagnetic rim will exert too strong a damping effect, nor too low or the coupling factor between the element on the wheel and the vehicle mounted components will be too low. Preferably the frequency is in the range 30 to 500 kHz.

WHAT I CLAIM IS:—

1. A device for monitoring the value of at least one variable of a motor vehicle wheel, comprising an element which extends around the whole circumference of the wheel and either acts as an aerial for a wheel-mounted transmitter coupled to one or more transducers which is or are responsive to the one variable or responsive each to a corresponding one of several variables, or which element acts passively as an inductive or capacitive coupling element in an oscillator circuit whose active components and power supply are mounted on the vehicle chassis and which coupling element is altered in its effect in response to variations of the variable or variables to vary the effective coupling value with respect to the said active components of the oscillator circuit.

2. A device according to claim 1, wherein the said element comprises a plurality of conductors and one or more transducers each responsive to a corresponding one of the variables to act upon the conductors to vary the coupling provided in the oscillatory circuit.

3. A device according to claim 1 or 2, wherein the said element is disposed within the tyre cover at a location spaced from the rim of the wheel.

4. A device according to claim 1 or 2, wherein the said element is disposed within the inner tube at a location spaced from the rim of the wheel.

5. A device according to claim 1 or 2, wherein the said element is disposed within a rim band fitted between the rim and an inner tube.

6. A device according to claim 5, wherein the said element comprises a temperature transducer in thermal contact with the wheel rim.

7. A device according to any of claims 1 to 6, wherein the said element acts as a coupling element in an oscillatory circuit whose frequency of oscillation is in the range of 30 to 500 kHz.

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1153900 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*